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Development of multi-legged walking robot using piezoelectric benders

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Biomimetic robots still have many problems to overcome in order to realize the diverse and efficient movement of life. To solve these problems, various attempts have been made. Many researchers are trying to make robots that are similar to the movement of living things and efficient and applying them to biomimetic robots through a new manufacturing process and materials, for example, such as soft mechanisms, piezoelectric, SMA and artificial muscle actuators. To solve this problem, a small robot using a piezoelectric bender was proposed.

In this study, a driving source of the biomimetic robot was investigated and a piezoelectric actuator as the most competitive driving source was found. The bimorph structure using piezoelectric ceramics had simple structure and easy to fabricate, and it had an excellent potential in terms of efficiency, as speed and energy density when comparing with other actuators for small robots. A piezoelectric small robot as shown in Fig. 1, using the piezoelectric benders as the small scale ambulatory robots was proposed.

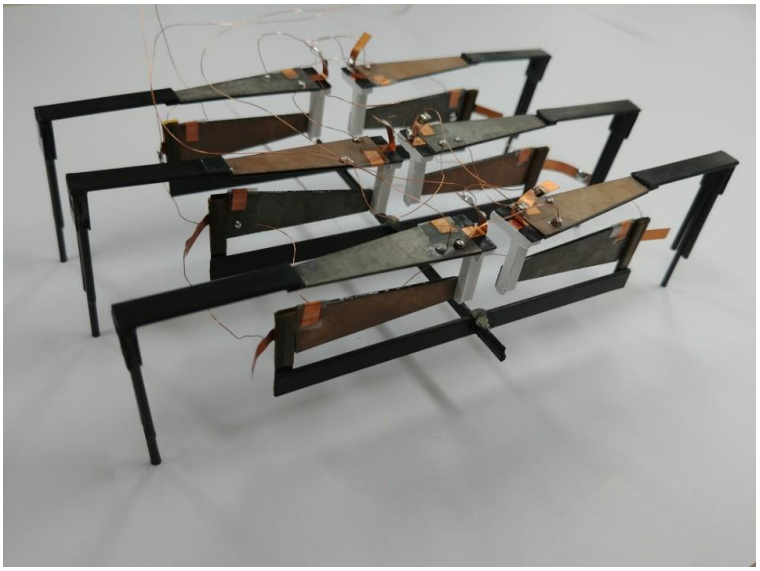

Figure 1. Manufactured multi-legged walking robot.

In order to make the motion of the biomimetic robot legs similar to the movements of the cockroaches or similar insects, two pairs of legs in the diagonal direction in the four leg structures are required to make the same movement. And the elliptical displacement is realized by considering the horizontal and vertical displacements of the multimodal vibration with intersecting perpendicular fields and by driving them by means of electrical signals with a phased difference of 90°. The piezoelectric small robot showed very competitive driving characteristics as a small scale robot actuator with simple structure.

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